Summary of Recent/Continuing NRC Research Activities Related to GSI-191

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Status of NRC Research

- Chemical Effect Tests:

  - Completed tests under present scope

  - Peer reviewed by an independent panel

  - Completed additional zinc corrosion tests with silica measurements as recommended by Peer Review Panel

  - Tests and results are documented in LANL report LA-UR-03-6415

- Calcium Silicate Head Loss Tests:

  - Tests completed and draft LANL report is under NRC review

- Debris Characterization and Additional Head Loss Tests:

  - Latent debris from 2 of 6 potential volunteer plants received by LANL

  - Separation and characterization have begun

Status of Chemical Effect Tests

- Experiments completed at UNM under direction of LANL
- LANL's draft test report peer reviewed by : Dr. Edward Lahoda (Westinghouse), Professors Peter Griffith (MIT) and Adrian Hanson (New Mexico State University)
- Tests and results are documented in LANL report LA-UR-03-6415

Summary of Chemical Effect Tests

- Concern is that post-LOCA chemical interactions between ECCS/CSS water and exposed materials may produce additional debris
- Issue was raised by ACRS in 2/03, cited evidence was "gelatinous" debris found in TMI after 1979 accident
- A limited-scope study was conducted to assess potential for chemically induced corrosion products to impede performance of ECCS recirculation after a LOCA in PWR plants
- No integrated tests were performed to demonstrate complete progression of chemical interactions from metal corrosion to the ultimate formation of precipitation products

Summary of Chemical Effect Tests (Continued)

- Separate-effects tests were conducted for each potential stage of the progression
- Precipitation was artificially induced in head loss flow tests by addition of metallic salts to the fluid
- Principal findings:

  If precipitated gelatinous debris is formed and transported to the sump screen, it can increase head loss across a fibrous debris bed
- Findings lend credibility to the concern raised by ACRS, but are not sufficient to provide a basis for plant-specific quantitative assessment of the issue

Summary of Peer Review Comments and Recommendations

- Comments included in LANL report as Appendix A
- Realistic head loss can only be determined with good corrosion rate data
- Corrosion rate data needed include:
  - Oxidation in air (pre-LOCA surface corrosion)
  - Corrosion from spray
  - Corrosion from submersion
- Materials commonly used in NPPs should be used for testing, e.g.:
  - Hot dipped galvanized coating - lead and other compounds could be present
  - concrete
  - silica sources such as dust and fiberglass
- Consideration of realistic accident scenarios
- Pointed out difference in head loss between surface filtration and bed filtration

Summary of Peer Review Comments and Recommendations (Continued)

- Corrosion rate for submersion should be measured in actively oxygenated/stirred tests
- Silica can reduce solubility of metal and its effects need to be investigated, e.g.:

  - Na-Al-Si gels can be formed and have very large volumes due to hydration
- Co-precipitation may have significantly different properties than the precipitants formed from single species (e.g., Na-Al-Si gels)
- Integrated tests should be performed with suitably scaled experiments that uses prototypical values of:

  - Water chemistry, water velocities, pool depths, water temperature, time, etc.
- Corrosion/leaching tests on zinc-rich primer coating need to be considered

Follow-on Chemical Effect Tests

- NRC to consider Peer Review Panel recommendations for future tests
- NRC to consider integrated tests:
  - Staff participation from RES and NRR
  - Scaled tests
  - Realistic / Prototypical
  - Timeliness
  - Industry involvement
  - Communicate with stakeholders